



Introduction - Staff



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Introduction

- Topics
 - Engagement & Communication with CFL
 - Pavement Rehabilitation Techniques and Alternatives
 - Updates and Reminders
 - Innovation / EDC-6
 - Q&A

Engagement & Communication

- Engage with CFL staff early in project development
- Some examples of potential issues-
 - Traffic data and assumptions
 - Design resilient modulus
 - Constructability
 - Material questions
 - SCRs



Engagement & Communication

- Field Investigation Plan
 - Scope
 - Sampling interval and type
 - Testing and analysis
 - Special or project specific needs-
 - Test pits, coring, soil corrosivity
 - Material sources
 - Pavement distress evaluation



Engagement & Communication

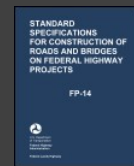
- Quick and Brief communication throughout recommendation and report development
 - Upon completion of field investigation
 - Upon identifying issues or concerns
 - Clarification of “gray” areas

Engagement & Communication

- Development of preliminary recommendations
 - Engagement with risk and assumptions:
Desirable to have **simple & optimal recommendations**. Avoid overly conservative recommendations.
 - Traffic and Subgrade
 - Constructability and flexibility
 - Material availability
 - Contractor availability

Engagement & Communication

- Development of final recommendations
 - Changes from preliminary recommendations and why
 - Use FP-14 and associated SCRs
 - Development of project specific SCRs for unique, new, or innovative materials or processes





Pavement Rehabilitation Techniques and Alternatives

- Recycling & Reclamation Methods Used
 - Section 304 Full Depth Reclamation (FDR)
 - Section 305 FDR with cement
 - Section 306 FDR with asphalt (foamed or emulsified asphalt)
 - Section 310 Cold In-Place Recycling

FDR – The Process

FDR Definition: Full depth reclamation is a reclamation technique in which the full flexible pavement section and a **predetermined** portion of the underlying materials are **uniformly** crushed, **pulverized**, or blended, resulting in a stabilized base coarse; further stabilization may be obtained through the use of **additives**. *(from ARRA)*

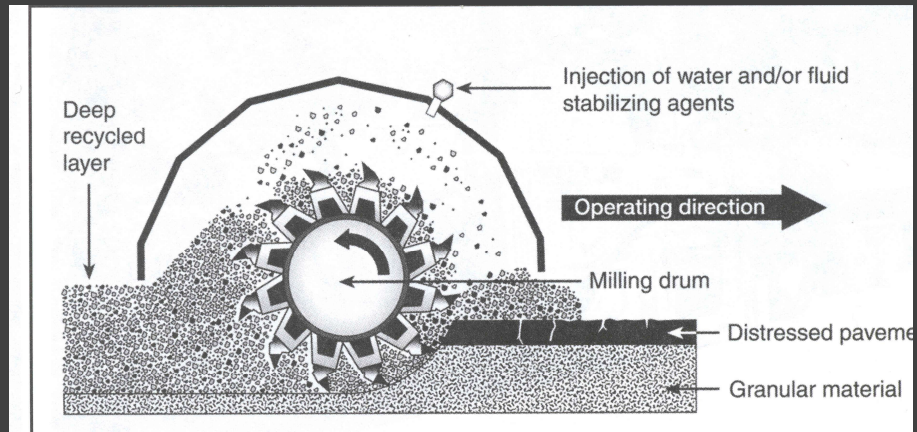
FDR – The Process

The main piece of equipment is the reclaimer with a rotor or cutting head that can penetrate through the pavement and into the base. CFLHD has utilized FDR within a 4" to 12" range (6", 8", 10" most common)

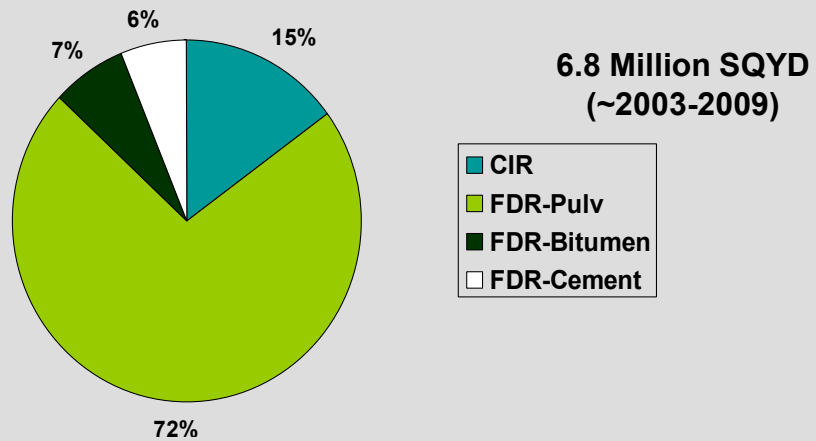




FDR Milling Head



In-Place Recycling in FLHD



Pavement Rehabilitation Techniques and Alternatives

- Candidate projects-



FDR Field Investigation

Determine thickness, consistency, type, gradation, and quality of asphalt pavement, base, and subgrade.

- Consistency of the quality and thickness of existing materials affect FDR recommendations

FDR Field Investigation

Typical Sampling:

- Layer depth measurements every 0.25 miles (in between this distance as appropriate)
- Bulk subgrade sample taken every 0.5 to 1.0 depending upon consistency

Less Common:

- Test pits (bulk base and/or pavement sampling)



Recommend 8" Diameter Auger



Field Investigation for FDR

Reconnaissance	Sampling Frequency	Purpose
Pavement Distress Review	Project wide	-Document suitability; isolate problem spots
Pavement Layer Depths, Uniformity, Quality	Every ¼-mile	Determine: -Feasibility -Recycling Depth
Subgrade soil	Minimum 1 per mile (DCP supplements)	-Structural design -Support for equipment

FDR – Additional Considerations

- FDR is best suited for low to medium volume roads
- Consider economy of scale with project size
- The pavement distress should be to the point that a surface treatment or an overlay is not effective
- Very weak/wet subgrade cannot be addressed by FDR alone

FDR – Additional Considerations

- Parking lots or pullouts may be difficult to treat while using a nurse truck.
- Minor widening of the road can be easily accommodated
 - With adequate bench width, widening by 1 or 2 feet usually okay. However, when widening by more than 2 feet, reconstructing the shoulder with imported aggregate is more typical.
- Let field investigation guide decision



FDR – Additional Considerations

- Manholes, curb & gutter, and barrier walls can be addressed
- Preferable that existing roadway geometries are not in need of major modification (i.e. horizontal and vertical alignment adjustments)
- Optimize the type of FDR based upon project scope, risk, and constraints

Pavement Rehabilitation Techniques and Alternatives

■ New guidelines on 4 types of 3R scopes

3R Project Type	Pavement only	Superelevation Correction	Widening	Minor Horizontal/Vertical Alignment Adjustments (or any combination of previous categories)	Comments
Type Description	All improvements are on the bench intended to rehabilitate the pavement and substantially match existing pavement width and cross slope. Includes existing normal cross slope. No superelevation correction in horizontal curves. No widening. No horizontal/vertical alignment adjustments.	Superelevation correction in horizontal curves, either at spot locations or throughout. Includes any major slope corrections that would result in significant pavement surface elevation changes. No pavement widening. Lane and shoulder widths remain the same as existing. No horizontal/vertical alignment changes or adjustments.	Resurface widening that can be attributed to a wider lane or shoulder than existing. Includes shoulder widening when the proposed lane and shoulder widths equal the existing lane and shoulder widths throughout the project, but there are spot locations where there is narrower pavement that must be widened to accommodate the proposed lane and shoulder widths. This category includes widening to one or both sides of the roadway to obtain a consistent roadway width. Widening that occurs in conjunction with horizontal/vertical alignment adjustments is not included in this category.	Any horizontal/vertical alignment adjustments. Engineered horizontal/vertical alignments are provided in adjustment areas.	
Typical Pavement Widening	No widening except what is required to construct safety edge and acceptable landscape or proposed pavement.	No lane or shoulder widening except what is required to construct acceptable landscape due to change in superelevation. Correction to superelevation only.	Shoulder widening on or off the bench. Widening is consistently applied to one or both sides. If widening is optional to have on both from one side to the other, it should be limited as minor horizontal/vertical adjustments.	May include widening or spot widening along with horizontal and vertical adjustments.	
Structural Section (desires to achieve full new AC surfacing)	FGF + Overlay, Overlay without FGF, MB + Overlay, and CR and Overlay.	CR + Additional Aggregate + Overlay. To achieve the desired cross slope, construct lanes using recycled (reclaimed) pavement materials, wedge and level, and/or imported aggregate.	CR + Overlay, Overlay without FGF, MB + Overlay, and CR and Overlay, CR + Additional Aggregate + Overlay, Spew/CR, raised and/or asphalt aggregate base under the existing pavement section.	Where the horizontal/vertical is adjusted, typically this includes widening and leveling the existing pavement structure that is handled first, removed and then with new aggregate if necessary and placed to achieve the desired width, thickness and elevation.	
Existing Alignment Changes	No changes to existing horizontal or vertical alignment.	No horizontal changes other than changes in cross of superelevation correction.	No changes to existing horizontal alignment.	Minor horizontal adjustments. Engineered horizontal is provided. The include and treatment such as banking or isolated horizontal curve.	
Profile	Match existing, also overlay depth. On rail and water projects, profile may remain unchanged.	No change to vertical alignment. Match existing also overlay depth unless riding or other means are used to match final profile grade with existing.	No change to vertical alignment. Match existing also overlay depth unless riding or other means are used to match final profile grade with existing.	Engineered vertical alignment is provided where adjustment is made.	
Superelevation	Match existing superelevation in horizontal curves.	Adjustments to superelevation in horizontal curves after throughout alignment or spot locations.	Match existing cross slope and superelevation in horizontal curves.	Horizontal/vertical adjustments decide that new superelevation is determined (designed and provided).	From FHWA 8-1-7. On 3R projects, provide proper superelevation and transition. When standard superelevation rate is required, the highest acceleration rate applies, subject to approval through the design exception process. Where exceptions are necessary, speed studies should identify locations for speed and warning sign installations.
Barbwork	No excavation or embankment.	No excavation or embankment. Paved grade change on accelerated existing aggregate and/or resurfacing FGF and overlay aggregate material.	Offroad, shoulder for widening. Includes excavation of an existing slope to make room for widening as well as placing embankment if there is road crown on the bench for widening.	Shall include work under the coordinate handling of material, etc., depending on extent of horizontal/vertical adjustment.	

Pavement Rehabilitation Techniques and Alternatives

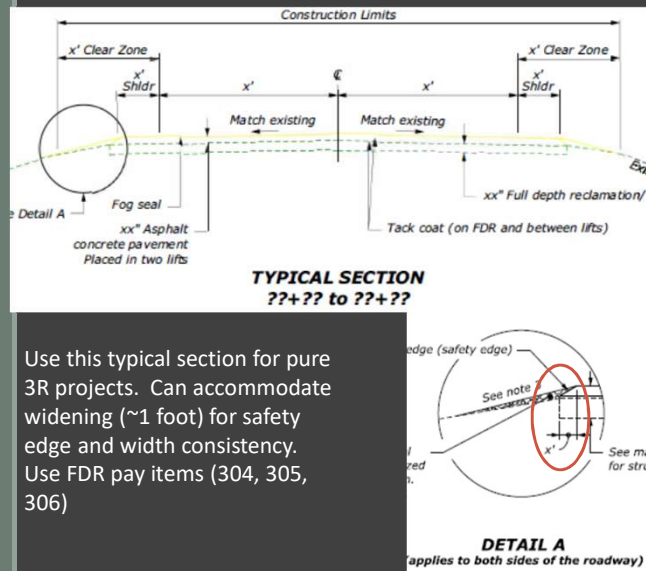
■ New guidelines on 4 types of 3R scopes

- “Pavement only”
- “Superelevation correction”
- “Widening”
- “Minor horizontal/vertical alignment adjustments”

Pavement only

All improvements are on the bench intended to rehabilitate the pavement and substantially match existing pavement width and cross slope.

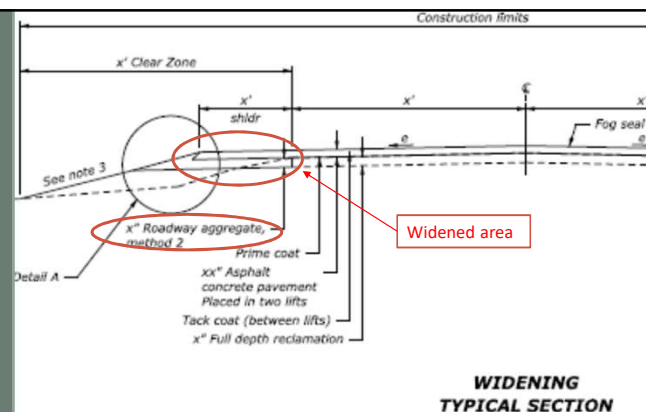
Includes restoring normal cross slope. No superelevation corrections in horizontal curves. No significant widening. No horizontal /vertical alignment adjustments.



Widening

Roadway widening that can be attributed to a wider lane or shoulder than existing (typically 3 or more feet).

This category includes widening to one or both sides of the roadway to obtain a consistent roadway width.



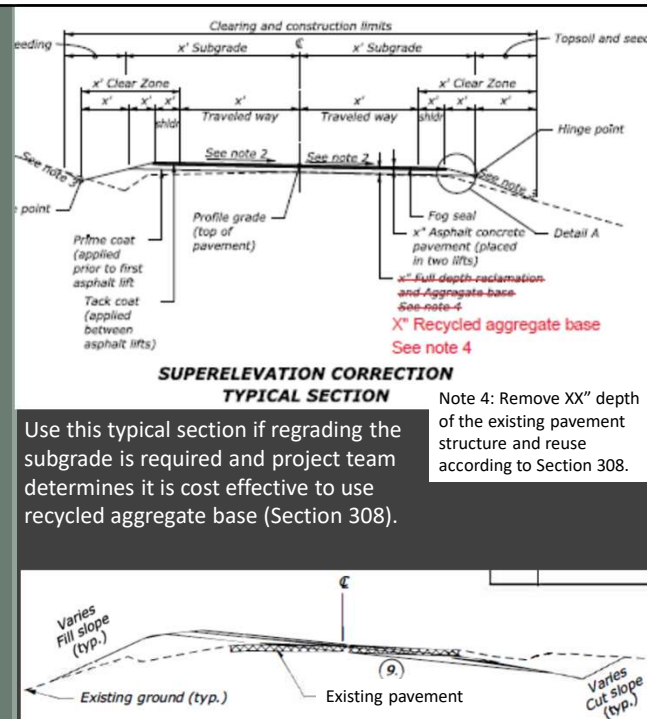
Use 302 Roadway Aggregate for the widened section and FDR items (e.g. 304) for the existing pavement.

Super Correction

Superelevation corrections in horizontal curves

Includes any major slope corrections that would result in significant pavement surface elevation changes

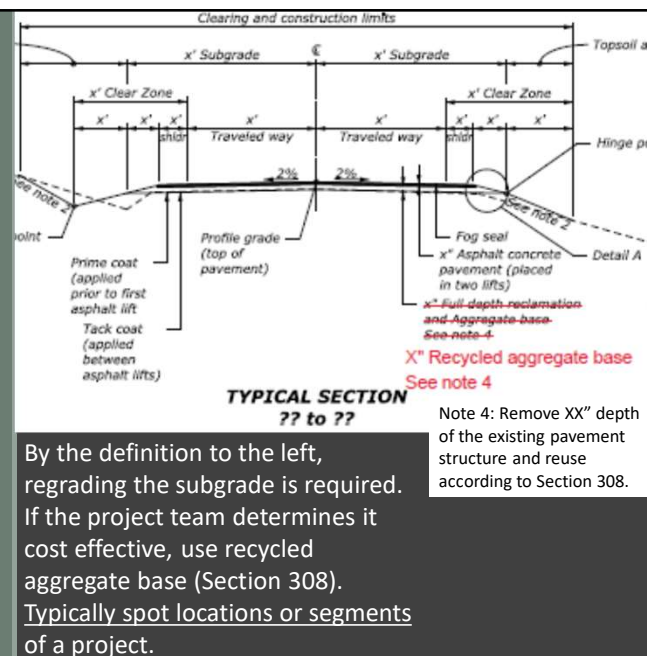
No alignment changes or adjustments



Minor horz. /vertical alignment adjustments

Any horizontal/vertical alignment adjustments. Engineered horizontal/vertical alignments are provided in adjustment areas.

Where the horizontal/vertical is adjusted, typically this includes importing aggregate base and/or removing and reusing the existing pavement structure. Materials is handled twice (removed/stored and then placed to achieve desired thickness and width).



By the definition to the left, regrading the subgrade is required. If the project team determines it cost effective, use recycled aggregate base (Section 308). Typically spot locations or segments of a project.

Pavement Rehabilitation Techniques and Alternatives

- Think in-place recycling first!
 - Very cost effective
 - Great long-term performance
 - About 40 years of experience
 - Tremendous amount of institutional confidence in the process



Updates and Reminders

Updates and Reminders

- PDDM Design Exceptions
 - Avoid changes to standard inputs (reliability, initial/terminal serviceability, minimum ESALs, standard deviation) to artificially meet design life
 - Discuss with CFL project support team
 - Use local experience / previous performance history

Updates and Reminders

- Continued focus on Engineer's Estimate
 - Significant improvement this past year
 - Bid prices may be volatile post-COVID 19 restrictions and post-stimulus
 - Support cost-based estimates when warranted (particularly for asphalt and aggregate bid items)
 - Link to EE Manual:
<https://highways.dot.gov/federal-lands/estimates/cfl/estimate-manual>



Innovation / EDC-6

- Encouraged to be innovative and bring ideas to the table.
- Current FLH initiatives:
 - Supporting FHWA Performance Engineered Pavement (PEP) efforts
 - Internally cured concrete (ICC) and service life design of bridges
 - Use of fibers in asphalt mixes

Innovation / EDC-6



- EDC-6 initiative: Targeted Pavement Overlay Systems (TOPS)
 - Right overlay treatment to the right location (high priority / high maintenance areas)
 - Includes both concrete and asphalt overlays
 - FLH has not selected TOPS as one of their primary focus technologies
 - Not applicable for most FLH projects

Innovation / EDC-6



- Concrete overlay products
 - Unbonded concrete on concrete
 - Unbonded concrete on asphalt
 - Unbonded concrete on composite
 - Bonded concrete on concrete
 - Bonded concrete on asphalt
 - Bonded concrete on composite

Innovation / EDC-6

- General Scope of Asphalt Products
 - Alternative materials and mixture design for higher-performance and durability
 - Alternative overlay mixture designs & surface types to address •Friction •Noise •Drainage

Adds **durability** to high traffic locations (truck routes, intersections, roundabouts)

Preserves existing pavement through thin durable overlays

Addresses key **functionality** parameters of pavements

Innovation / EDC-6

- Asphalt overlay products
 - High-Performance Thin Overlay
 - Crack Attenuating Mixture
 - Highly Modified Asphalt
 - Enhanced friction overlay
 - Stone matrix asphalt (SMA)
 - Asphalt Rubber Gap-Graded
 - Open-Graded Friction Course (OGFC)
 - Ultra-thin bonded wearing course (UTBWC)



Reduced splash and spray and improved visibility on OGFC section. Source: National Center for Asphalt Technology

